Coordination of Low-Dose Radiation Research with the National Institute of Allergy and Infectious Diseases (NIAID)

Andrea DiCarlo, PhD

RNCP Associate Director

Division of Allergy, Immunology and Transplantation

Office of the Director

NASEM Meeting

September 24, 2021

National Institute of Allergy and Infectious Diseases

Radiation and Nuclear Countermeasures Program (RNCP)

RNCP Talk Overview

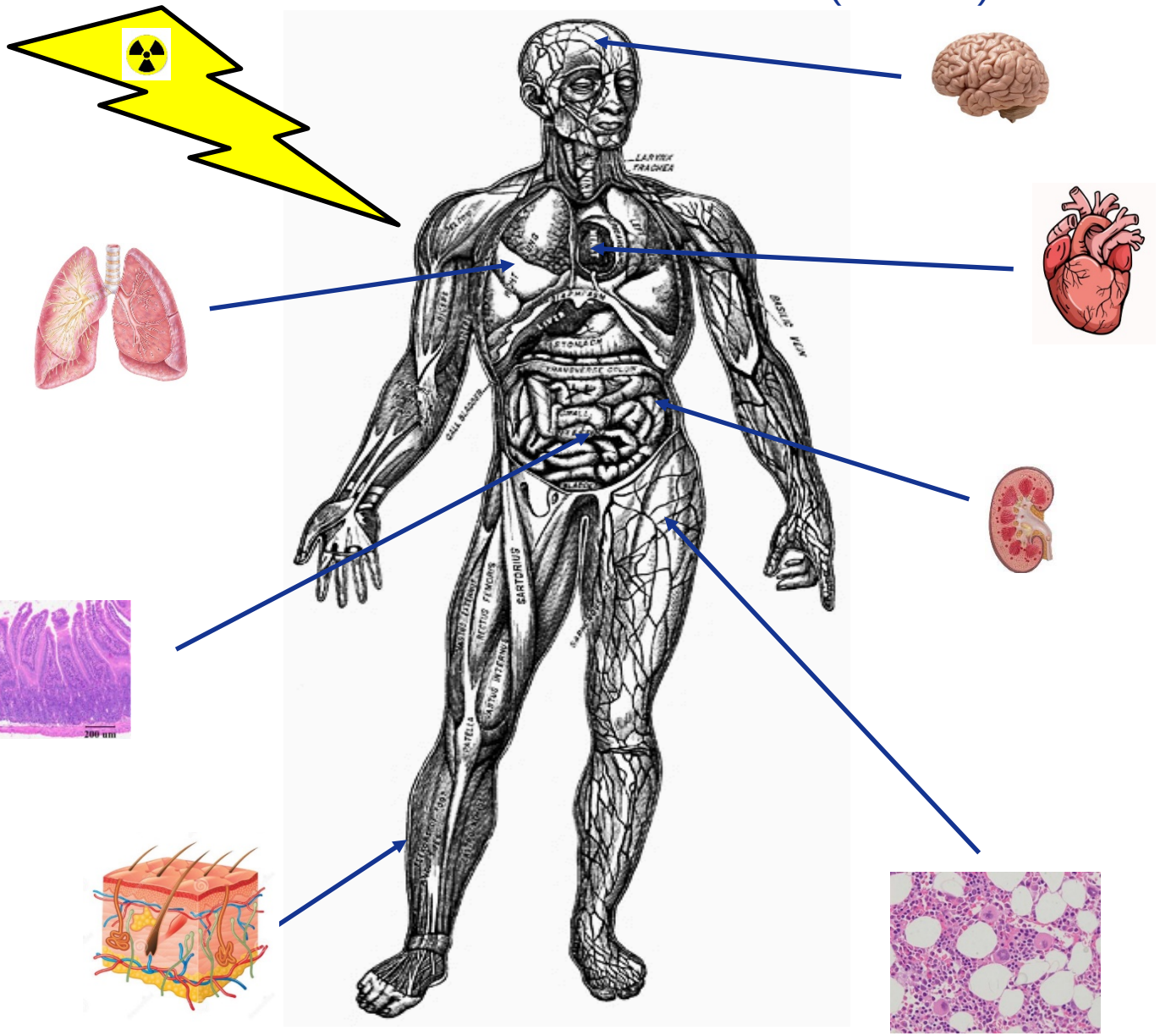
- History & mission
- Overview of supported research
- Scientific contributions
- Available infrastructure
- Collaborations with other agencies
- Summary of capabilities & interest

RNCP History & Mission

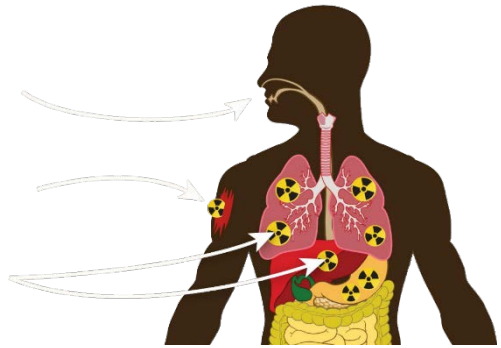
- Radiation scenarios
  - Detonation of a nuclear bomb or improvised nuclear device
  - Nuclear power plant accident or attack
  - Radionuclide exposures
- Short-term focus on triage/treatment of life-threatening, high dose irradiation
- Long-term emphasis on delayed effects of acute radiation exposure
- Low-doses are a concern, but not in mandate

RNCP-Supported Research

Medical Countermeasures (MCMs)

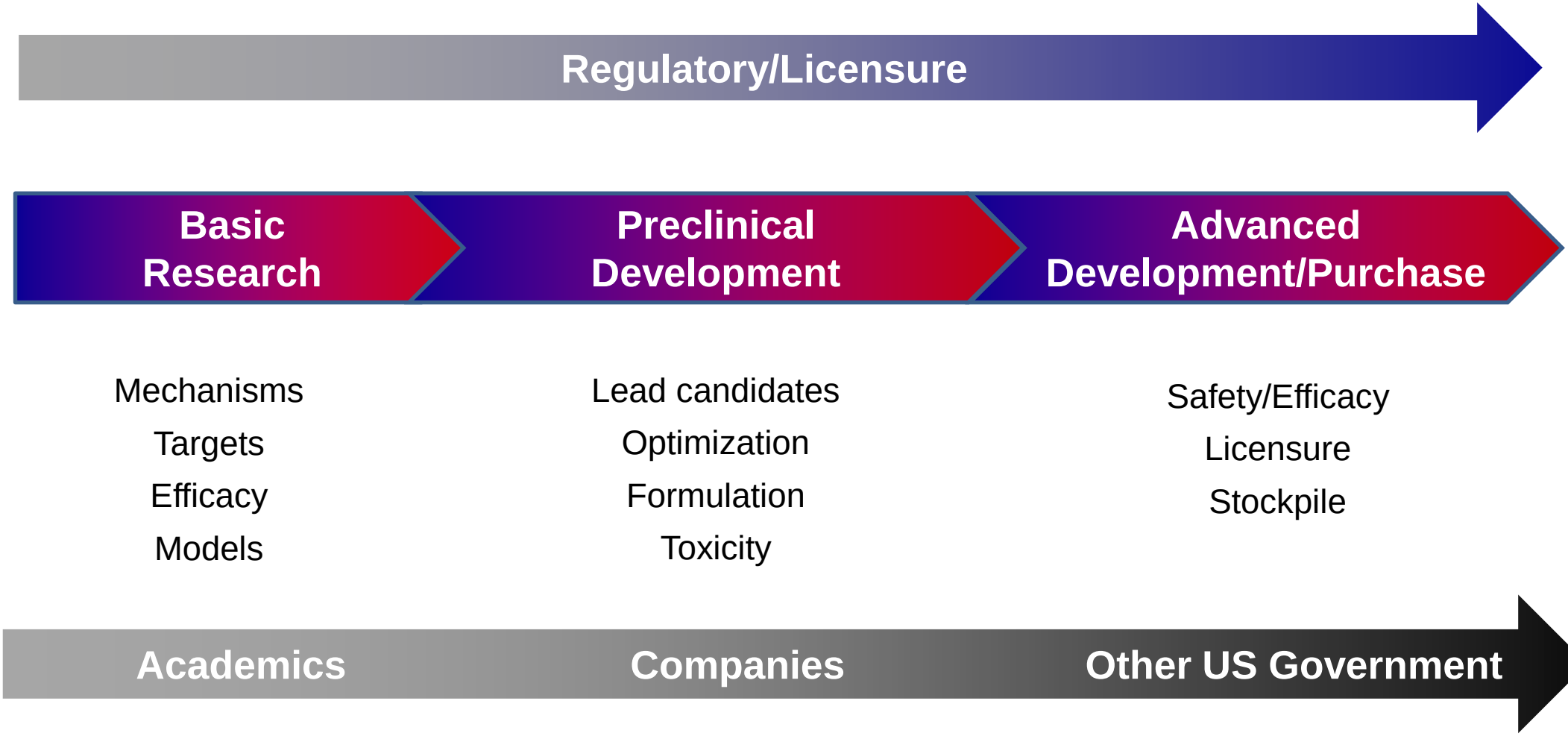


Biodosimetry



Decorporation

RNCP Funds Science at Different Stages



Many grant/contract awardees also receive funds from other agencies

Over 600 approaches studied to date

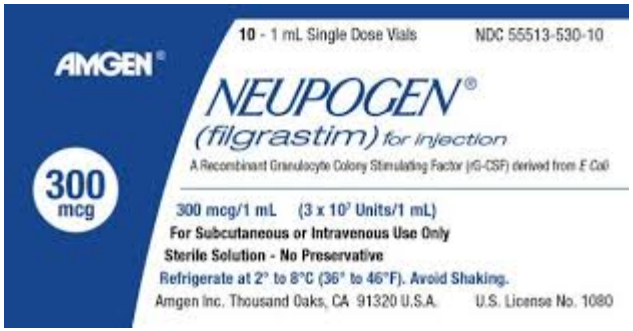
Funding Opportunities Since 2004

- 26 requests for grant applications
- 16 contract solicitations
- 8 small business program announcements
- >75 supplements to existing awards
- Research support provided to NIH institutes
  - NCI, NIDDK, NIA, NCATS, NICHD
- Scientific funding shared with other government agencies
  - DoD (AFRRI), BARDA, NASA, FDA

Approved Products for Hematopoietic Acute Radiation Syndrome (ARS)

Licensures achieved using the FDA Animal Rule

2015



Neulasta® (pegfilgrastym)

2018

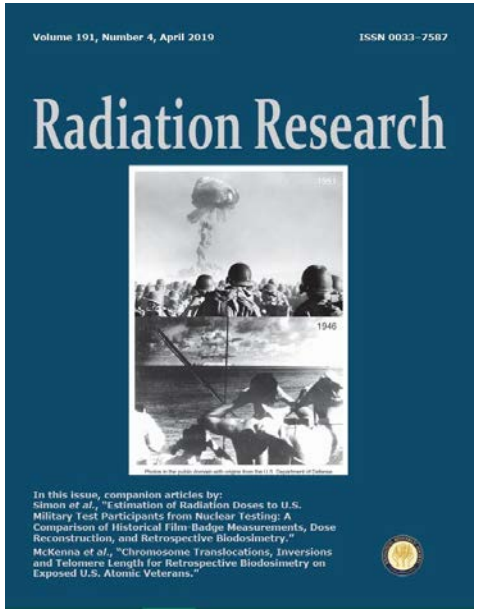
2021

Nplate® romiplostim injection

Stimulates megakaryocytes to increase platelets

Stimulate bone marrow to increase neutrophils

RNCP Funds Epidemiology & Retrospective Biodosimetry Research at NCI



Estimation of Radiation Doses to U.S. Military Test Participants from Nuclear Testing: A Comparison of Historical Film-Badge Measurements, Dose Reconstruction, and Retrospective Biodosimetry.

McKenna MJ, Robinson E, Taylor L, Tompkins C, Cornforth MN, Simon SL, Bailey SM. Chromosome Translocations, Inversions and Telomere Length for Retrospective Biodosimetry on Exposed U.S. Atomic Veterans. Rad Res. 2019

IOP PUBLISHING PHYSICS IN MEDICINE AND BIOLOGY
Phys. Med. Biol. **56** (2011) 7317–7335 doi:10.1088/0031-9155/56/22/020

Development of state-of-the-art computer program for individual organ dose calculations from radiological accidents or terrorist events (2016)

Comparison of internal dosimetry factors for three classes of adult computational phantoms with emphasis on I-131 in the thyroid

Stephanie Lamart[1], Andre Bouville[2,5], Steven L Simon[1], Keith F Eckerman[3], Dunstana Melo[4] and Choonsik Lee[1,6]

25 RNCP Scientific Meetings Since 2005

- Recent RNCP meeting reports
  - Growth Factors and Cytokines for Radiation Injuries (July 2019)
  - Cutaneous Radiation Injuries (June 2020)
  - Neutron Radiobiology and Dosimetry (May 2021)
  - Poly-Pharmacy Approaches for Acute Radiation Syndrome (July 2021)
  - Pathophysiology of Radiation-Induced Lung Injury (July 2021)

Recent RNCP Staff Review Articles

RADIATION RESEARCH 195, 1–24 (2021)
0033-7587/21 $15.00

DOI: 10.1667/RADE-20-00188.1

REVIEW

Commonalities Between COVID-19 and Radiation Injury

Carmen I. Rios,[1] David R. Cassatt, Brynn A. Hollingsworth, Merriline M. Satyamitra, Yeabsera S. Tadesse, Lanyn P. Taliaferro, Thomas A. Winters and Andrea L. DiCarlo

Radiation and Nuclear Countermeasures Program (RNCP), Division of Allergy, Immunology and Transplantation (DAIT), National Institute of Allergy and Infectious Diseases (NIAID), National Institutes of Health (NIH), Rockville, Maryland

metabolites

MDPI

Review

Metabolomics in Radiation Biodosimetry: Current Approaches and Advances

Merriline M. Satyamitra [1,*], David R. Cassatt [1], Brynn A. Hollingsworth [1], Paul W. Price [2], Carmen I. Rios [1], Lanyn P. Taliaferro [1], Thomas A. Winters [1] and Andrea L. DiCarlo [1]

Acute Radiation Syndrome and the Microbiome: Impact and Review

*Brynn A. Hollingsworth, David R. Cassatt, Andrea L. DiCarlo, Carmen I. Rios, Merriline M. Satyamitra, Thomas A. Winters and Lanyn P. Taliaferro **

Radiation and Nuclear Countermeasures Program (RNCP), Division of Allergy, Immunology and Transplantation (DAIT), Nationa

Study logistics that can impact medical countermeasure efficacy testing in mouse models of radiation injury

Andrea L. DiCarlo, Zulmarie Perez Horta, Carmen I. Rios, Merriline M. Satyamitra, Lanyn P. Taliaferro & David R. Cassatt

Radiation Research Funding Capabilities

- Infrastructure to support research grants & contracts
  - Concept development
  - Solicitation
  - Peer review
  - Budget & scientific award oversight
- Familiarity with the research community
  - Crossover of investigators between DOE, DoD, NCI, NASA, BARDA
  - Commitment to encouraging young investigators
- Radiation subject matter expertise
- Database of all NIAID-funded research

Prior DOE Interactions

- RNCP has not had formal collaborations with DOE; however
  - NIAID Radiation Nuclear Group has DOE representation.
  - Informal interactions occur at DOE and other meetings (RRS, Health Physics Society, ICRR)

Potential RNCP & DOE Low-Dose Research Program Collaborations

- Low dose and high dose exposures explored to identify similarities and differences
  - Pathways
  - Biomarkers (e.g., “omics”)
  - Epidemiology
- Studies involving biological consequences of low dose exposures of interest to the NIAID program
  - Environmental levels after a radiological or nuclear incident
  - Radiation hormesis / benefits of low dose radiation
- Computer-based efforts
  - Database sharing/mining to find common areas of study

Collaborations Within Government

Trans-Agency Activities

- Radiation Nuclear Group (RNG)
  - Monthly meetings with government program staff hosted by RNCP
  - Participants invited to all RNCP scientific conferences
- Radiobiology Bioterrorism Research & Training Group
- RNCP staff serve on HHS Energy Employees Occupational Illness Compensation review panels (NIOSH)

Non-Government/Global Involvement

- Radiation Injury Treatment Network - cosponsors of scientific meetings
- RERF contract for research and epidemiological studies
- WHO-Radiation Emergency Preparedness Action Network Collaborating Center
- NCRP presentation to Program Area Committees
- Statement of Intent to collaborate with the Institut de radioprotection et de sûreté nucléaire (IRSN)
- Industry interactions with 300+ companies

Summary of the NIAID RNCP

- Successful **funding** of science at all stages of development
- **Collaborations** with organizations engaged in radiation research
- **Experience & infrastructure** to solicit, receive, review, award and provide essential oversight for radiation research
- **Knowledge** of the research community; funding many investigators who receive support from other programs
- Host of 25 scientific conferences, **sharing outcomes** through peer-reviewed publications
- Authoring review articles to **inform** the research community

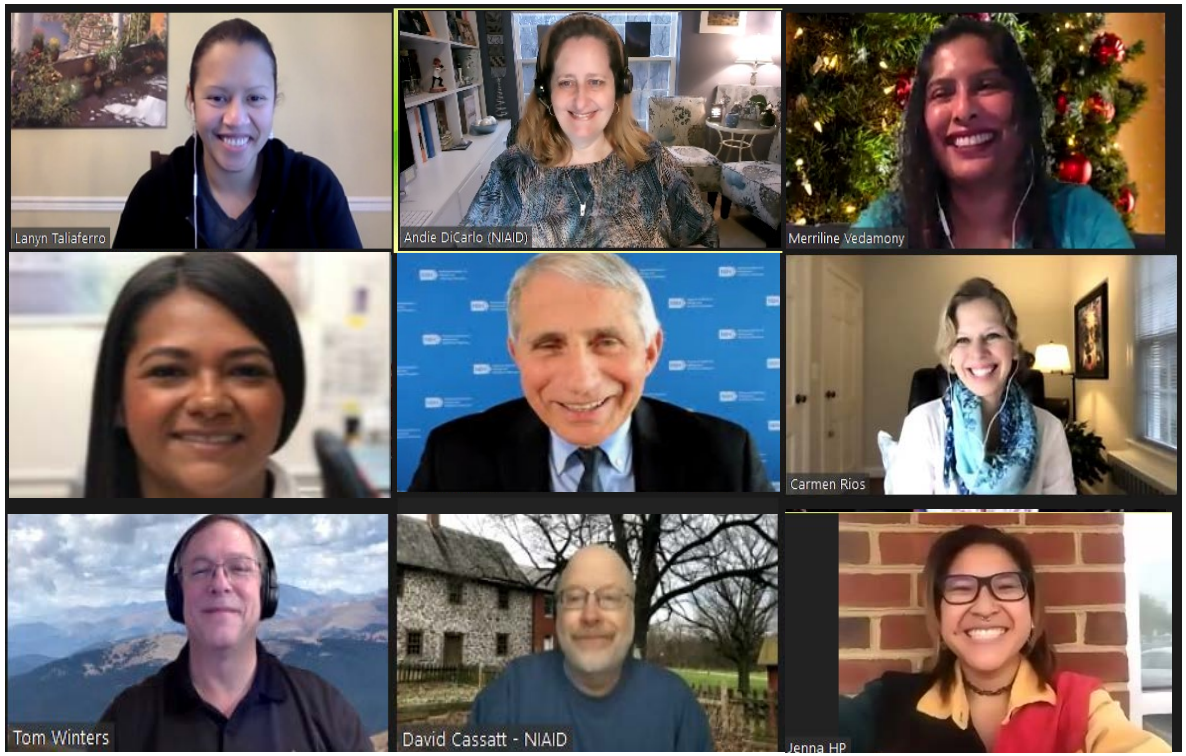
The NIAID team

cohena@niaid.nih.gov

Lanyn Taliaferro, PhD

Olivia Molinar-Inglis, PhD

Tom Winters, PhD



Merriline Satyamitra, PhD

Carmen Rios, PhD

Jen Harrison-Peters, BS

David Cassatt, PhD

Thank you!